REMARKS

Applicants respectfully request entry of the foregoing and reconsideration of the subject matter identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.114, and in light of the remarks which follow.

Claims 48-84 are pending in the application, claims 1-47 having been canceled above and new claims 48-84 having been added above.

Applicants thank the Examiner for acknowledging receipt and entry of the amendments filed on April 7, 2003, and the newly submitted claims 18-47.

By the above amendments claims 1-47 are canceled and new claims 48-84 are added. New claims 48 and 58 correspond closely to canceled claim 1. Like many of the added claims, claims 48 and 58 both recite that the selenium is in the form of sodium selenite, selenocysteine or selenoyeast. Support for this recitation can be found at least at page 7, lines 1-4 of the specification. New claims 70 and 71 correspond closely to canceled claim 18. New claims 72-74 correspond closely to canceled claim 9, but are written in independent form. New claims 75-77 correspond closely to canceled claim 24. New claims 78-80 correspond closely to canceled claim 42. New claims 81 and 82 correpsond closely to claim 30. New claim 83 corresponds closely to claim 36. Finally, new claim 84 corresponds closely to canceled claim 11. Applicants have added new claims 48-84 to further define exemplary embodiments of the invention and to clarify the record. As many of the new claims are identical to or broader than corresponding canceled claims, Applicants submit that the addition of such claims does not constitute a narrowing amendment made for purposes of patentability.

Turning now to the Official Action, claim 17 continues to be subject to a Restriction Requirement for being drawn to a non-elected invention. Applicants understand that the Restriction Requirement has been made final. Claim 17 has been canceled. However, new claims 68 and 69 correspond closely to canceled claim 17. Thus, Applicants now request that process claims 68 and 69 be rejoined with the product claims.

Where product and process claims are presented in the same application, in the case of an elected product claim, rejoinder will be permitted when a product claim is found allowable and the withdrawn process claim depends from or otherwise includes all of the limitations of an allowed product claim. See MPEP §821.04. Because process claims 68 and 69 added above, include all of the limitations of elected product claims 48 and 58, and because it is believed that these product claims are patentable over the cited references, Applicants submit that process claims 68 and 69 must be rejoined with the product claims.

For at least the above reasons, Applicants respectfully request rejoinder of claims 68 and 69.

Claims 1-7, 9, 11, 14-16 and 19-47 stand rejected under 35 U.S.C. §102(b) as being anticipated by Drug Launches. As these claims have been canceled, the rejection is moot. However, in an effort to expedite prosecution of the application, Applicants provide the following remarks. For at least the reasons that follow, withdrawal of the rejection is in order.

Claim 48, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the vitamin A, vitamin C,

vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition. (Emphasis added.)

Claim 58, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition, and wherein the selenium is present in an amount of between about 70 μg and about 120 μg. (Emphasis added.)

Claim 72, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, wherein the vitamin A, vitamin C, vitamin E, zinc and selenium are the only active agents in the composition, wherein the selenium is present in an amount between about 70 μg and about 120 μg, and wherein the composition is formulated for oral administration, in a cosmetically/pharmaceutically acceptable vehicle, diluent or carrier thereof. (Emphasis added.)

Claim 73, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition, wherein the selenium is present in an amount between about 70 μg and about 120 μg, and wherein the composition is

formulated for oral administration, in a cosmetically/pharmaceutically acceptable vehicle, diluent or carrier thereof. (Emphasis added.)

Claim 74, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition, and wherein the composition is formulated for oral administration, in a cosmetically/pharmaceutically acceptable vehicle, diluent or carrier thereof. (Emphasis added.)

Claim 75, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg to about 40 mg of zinc and about 70 μg to about 120 μg of selenium, wherein the composition is formulated as a tablet and wherein the vitamin A, vitamin C, vitamin E, zinc, and selenium are the only active agents in the composition. (Emphasis added.)

Claim 76, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg to about 40 mg of zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the composition is formulated in a tablet and wherein the vitamin A, vitamin C, vitamin E, zinc, and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition. (Emphasis added.)

Claim 77, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg to about 40 mg of zinc and about 70 μg to about 120 μg of selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the composition is formulated in a tablet and wherein the vitamin A, vitamin C, vitamin E, zinc, and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition. (Emphasis added.)

Claim 78, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg to about 40 mg of zinc and about 70 μg to about 120 μg of selenium, wherein the composition is formulated for oral administration. (Emphasis added.)

Claim 79, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg to about 40 mg of zinc and of selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the composition is formulated for oral administration. (Emphasis added.)

Claim 80, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture comprising about 0.1 mg to about 3 mg of vitamin A, about 50 mg to about 240 mg of vitamin C, about 10 mg to about 60 mg of vitamin E, about 10 mg

to about 40 mg of zinc and about 70 μg to about 120 μg of selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the composition is formulated for oral administration. (Emphasis added.)

Claim 81, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast wherein the vitamin A, vitamin C, vitamin E, zinc and selenium are the only active agents in the composition and wherein the composition is a topical anti-hair loss composition. (Emphasis added.)

Claim 82, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast wherein the vitamin A, vitamin C, vitamin E, zinc and selenium are the only active agents in the composition, wherein the composition is a topical anti-hair loss composition, and wherein the selenium is present in an amount between about 70 μg and 120 μg. (Emphasis added.)

Claim 83, as added above, recites a cosmetic/pharmaceutical composition comprising an admixture of vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, wherein the vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium, are the only active vitamins and metals in the composition. (Emphasis added.)

Claim 84, as added above, recites a cosmetic/pharmaceutical composition, comprising an admixture of vitamin A, vitamin C, vitamin E, zinc, selenium in the form of sodium selenite, selenocysteine or selenoyeast, and at least one member selected from the

group consisting of iron, magnesium, copper, manganese and combinations thereof, wherein the vitamin A, vitamin C, vitamin E, zinc, selenium, in the form of sodium selenite, selenocysteine or selenoyeast, and at least one of iron, magnesium, copper, manganese or combinations thereof are the only active agents in the composition, and wherein the selenium is present in an amount of between about 70 μg and about 120 μg. (Emphasis added.)

The Official Action takes the position that "Drug Launches teaches Ocuvite®, which comprises zinc oxide (40 mg), copper oxide (2 mg), vitamin C (60 mg), vitamin E (30 IU or 30 mg), vitamin A (as beta-carotene, 5000 IU or 3 mg), and selenium (40 mcg)." (See Official Action at page 3.) Additionally, with respect to the Bausch & Lomb facsimile, relied on in support of the §102 rejection of the claims over Drug Launches, the Official Action states that Applicants' arguments (i.e., those concerning the amounts of ingredients disclosed in the Bausch & Lomb facsimile) are "neither persuasive nor commensurate in scope to the limitations of the claimed invention because the amounts of the relevant ingredients comprising the Ocuvite® still comprise the same amounts of the same ingredients as instantly claimed by Applicant." (See Official Action at page 4.)

Drug Launches appears to be a database printout describing a product sold under the tradename Ocuvite®, which comprises as "active ingredient" zinc oxide, 40 mg, copper oxide, 2 mg, vitamin C, 60 mg, vitamin E, 30 IU, vitamin A, 5000 IU and selenium, 40 mcg. Drug Launches further specifies that the disclosed product is provided in tablet form (i.e., "tabs") to be used for treatment and maintenance of ocular health.

The Bausch & Lomb facsimile also appears to describe a product sold under the tradename Ocuvite®, which includes the "active constituents" vitamin A (as beta carotene), vitamin C (ascorbic acid), vitamin E (as dl-α-tocopheryl acetate), zinc (zinc oxide), copper (cupric oxide) and selenium (sodium selenate). The facsimile also describes the disclosed compound in tablet form.

It is well established that in order to demonstrate anticipation under §102(b), each element of the claim at issue must be found, either expressly described or under principles of inherency, in a single prior art reference. See Kalman v. Kimberly-Clark Corp., 218 U.S.P.Q. 789 (Fed. Cir. 1983). That is not the case here.

First, Applicants recognize that the Official Action originally relied on the Bausch & Lomb facsimile to show that the Ocuvite® product was publicly available before the present application's filing date in a form that included vitamin A as beta carotene. However, the Official Action still has not established that the Bausch & Lomb facsimile is a proper prior art reference. That is, MPEP §2128 states that in order for a printed publication to constitute prior art, the document must have been "disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it." MPEP §2128 further states that "one who wishes to characterize the information, in whatever form it may be, as a 'printed publication' * * * should produce sufficient proof of its dissemination or that it has otherwise been available and accessible to persons concerned with the art to which the document relates and thus most likely to avail themselves of its contents." (Emphasis

added.) No proof has been provided to show that the Bausch & Lomb facsimile was disseminated or otherwise available and accessible.

Because the Official Action does not provide any proof to demonstrate that the Bausch & Lomb facsimile constitutes a proper "printed publication" under §2128, Applicants again submit that the reliance on this document as prior art is improper. That is, while it is possible that the Ocuvite® product was available at a time prior to the application's filing date in a form that included vitamin A as beta carotene, Applicants submit that the Patent Office must provide a proper prior art reference such as, for example, a publicly available technical journal or a U.S. or foreign patent to support this assertion. In the absence of such a reference, Applicants submit that the rejection of the claimed composition over Drug Launches in view of the Bausch & Lomb facsimile is improper, and should be withdrawn.

Moreover, even if the Bausch & Lomb facsimile were a proper reference or even if it could be shown to be accurate by providing proof to show that Ocuvite® was publicly available in a form that included vitamin A as beta carotene at a time prior to the application's filing date, neither Drug Launches nor the Bausch & Lomb facsimile, alone or in combination, expressly or inherently describe each element of the claims at issue.

For example, claims 48, 58, 72, 73, 74, 75, 76, 77, 78, 79, 80 and 84, as added above, all define compositions that include selenium, in the form of sodium selenite, selenocysteine or selenoyeast, and/or that define or further define the selenium to be present in an amount between about 70 μg and about 120 μg. In contrast, Drug Launches discloses a composition that includes selenium in an amount of 40 μg. Thus, Drug

Launches does not disclose or fairly suggest a composition comprising selenium, in the form of sodium selenite, selenocysteine or selenoyeast or a composition comprising selenium in an amount between about 70 μg and about 120 μg, as defined in the above independent claims. Also, the Bausch & Lomb facsimile discloses a composition that includes selenium, in the form of sodium selenate, not sodium selenite, selenocysteine or selenoyeast. For the Examiner's convenience, Applicants have attached pages 1546-1547 of the Merck Index (13th Edition 2001), which show that sodium selenate (Na_2SeO_4) is different than sodium selenite (Na_2SeO_3). Also, the Bausch & Lomb facsimile discloses an amount of sodium selenate, namely, 40 μg, which is outside of the claimed range.

In addition, claims 48, 58, 72, 73, 74, 75, 76, 77, 81 and 82 all recite that vitamin A, vitamin C, vitamin E, zinc and selenium are the only active agents in the composition. The compositions disclosed in Drug Launches and the Bausch & Lomb facsimile, however, include an additional active agent. In particular, Drug Launches lists copper oxide as an "active ingredient" and the Bausch & Lomb facsimile lists cupric oxide as an "active constituent." Thus, neither reference can be said to expressly or inherently describe a composition including the ingredients recited in claims 48, 72, 73, 74, 75, 76, 77, 81 and 82 as "the only active agents."

Claim 83 is also patentable over Drug Launches, by itself or in combination with the Bausch & Lomb facsimile. That is, claim 83 defines a composition wherein the vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active vitamins and metals in the composition. In contrast, however, both Drug Launches and the Bausch & Lomb facsimile disclose

compositions that include copper oxide as an "active ingredient" or "active constituent." Thus, neither Drug Launches nor the Bausch & Lomb facsimile expressly or inherently describe compositions wherein vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast, are the only active vitamins and metals in the composition, as defined in independent claim 83. In addition, claim 83 is further distinguished from Drug Launches, alone or in combination with the Bausch & Lomb facsimile because of the form of selenium recited. In particular, while claim 83 recites selenium, in the form of sodium selenite, selenocysteine or selenoyeast, Drug Launches fails to disclose any specific form of selenium and the Bausch & Lomb facsimile recites the use of sodium selenate. Thus, claim 83 is further distinguished from Drug Launches, alone or in combination with the Bausch & Lomb facsimile, on this basis.

Finally, claims 81 and 82 are further distinguished from the compositions of Drug Launches and the Bausch & Lomb facsimile because claims 81 and 82 recite "wherein the composition is a topical anti-hair loss composition." (Emphasis added.) That is, because the Ocuvite® product disclosed in the cited references is provided in tablet form, Applicants submit that both Drug Launches and the Bausch & Lomb facsimile fail to expressly or inherently describe a "topical anti-hair loss composition."

For at least these reasons, Applicants respectfully submit that claims 48, 58, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83 and 84 are patentable over Drug Launches, by itself or in combination with the Bausch & Lomb facsimile. The remaining claims, which depend, directly or indirectly, from these independent claims and are also patentable over

Drug Launches, alone or in combination with the Bausch & Lomb facsimile, for at least the reasons that the independent claims are patentable thereover.

Claims 1, 7, 8 and 10-13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kronnie in view of Cauwenbergh, Proctor and Nishida. Because these claims have been canceled, the rejection is moot. However, in an effort to expedite prosecution of the application, Applicants provide the following remarks.

To establish a *prima facie* case of obviousness, the prior art references (or references when combined) must teach or suggest all of the claim elements. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). In addition, "all words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385; 165 U.S.P.Q. 494, 496 (CCPA 1970). See MPEP §2143.03.

First, none of the references, alone or in combination, teach or suggest all of the claim elements. For example, Kronnie (DE 19757921) discloses a composition that includes cannabis sativa as an active ingredient. (See Kronnie at column 1, lines 29-38 and lines 60-67.) The attached unofficial translation of the words in column 1, line 50 of Kronnie confirms that cannabis is included in the disclosed composition as an active ingredient (i.e., the words "cannabis wirkt auch ohne die anderen wirkstoffe" translates roughly to "cannabis works also without the other active substances.") Thus, Kronnie fails to teach or suggest a composition wherein vitamin A, vitamin C, vitamin E, zinc and selenium, generally or in the form of sodium selenite, selenocysteine or selenoyeast, are the only active agents in the composition, as recited in claims 48, 58, 72, 73 and 74. That

is, Kronnie teaches a composition with an additional active agent, namely, cannabis, which is excluded by Applicants' claim language.

Similarly, claim 84 defines a composition wherein vitamin A, vitamin C, vitamin E, zinc, selenium, in the form of sodium selenite, selenocysteine or selenoyeast,and at least one of iron, magnesium, copper, manganese or combinations thereof are the only active agents in the composition. Thus, Kronnie also fails to teach or suggest all of the elements of claim 84, because Kronnie fails to teach or suggest a composition wherein the above-recited ingredients are the sole active agents in the composition.

Additionally, as admitted in the Official Action at page 6, the composition taught by Kronnie also fails to include selenium.

Cauwenbergh fails to overcome the deficiencies of Kronnie. That is, the Official Action has relied on Cauwenbergh for the teaching of a composition comprising selenium sulfide. However, claims 48, 58, 73, 74 and 84, as added above, define compositions that include selenium in the form of sodium selenite, selenocysteine or selenoyeast. Nowhere in Cauwenbergh is it disclosed or suggested that the composition should include selenium in the form of sodium selenite, selenocysteine or selenoyeast. Additionally, claims 58, 72, 74 and 84 define a composition wherein the selenium is present in an amount between about 70 μg and about 120 μg. In contrast, however, nowhere does Cauwenbergh disclose or suggest using any amount of sodium selenate, let alone the amount defined in claims 58, 72, 74 and 84.

Proctor fails to overcome the above deficiencies of Kronnie and Cauwenbergh. That is, Proctor (U.S. Patent No. 6,150,405) is directed to the use of sulfhydryl

compounds such as thioproline, homocysteine, cysteine and/or N-acetylcysteine for treating hair loss. Additionally, Proctor discloses the use of ascorbic acid or its esters for stimulating hair growth. Proctor does not, however, disclose or suggest the compositions defined in claims 48, 58, 72-74 and 84 comprising the recited ingredients, including selenium, in the form of sodium selenite, selenocysteine or selenoyeast, and/or in an amount between about 70 μg and about 120 μg, as the only active agents.

Finally, Nishida fails to overcome the deficiencies of Kronnie, Cauwenbergh and Proctor. That is, Nishida (JP 06256142) discloses a hair tonic containing carotenes and a cell-activating ingredient, preferably a mono- or diglyceride of 9-21 C fatty acid, which may also contain 1-hydroxy-2-pyridone and a plant extract having anti-inflammatory blood circulation-promoting and/or 5α-reductase-inhibitory activity. Thus, while the compositions of claims 48, 58, 72-74 and 84 are defined to include vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast and/or in an amount between about 70 μg and about 120 μg, as the only active agents in the composition, Nishida requires carotenes and a cell-activating ingredient. Thus, Nishida requires an additional active ingredient, namely, a cell-activating ingredient, which is excluded by the language of claims 48, 58, 72-74 and 84.

In view of the deficiencies in each of the cited references and the failure of the asserted combination of these references to overcome these deficiencies, Applicants submit that the above-asserted combination of references fails to teach or suggest all of the claim limitations. Thus, on this basis alone, Applicants submit that the Official Action has not established a *prima facie* case of obviousness.

Additionally, the above-asserted combination of references does not reflect a proper consideration of "all words" in the claim. In particular, because none of the cited references, alone or in combination, discloses or suggests a composition wherein vitamin A, vitamin C, vitamin E, zinc and selenium, in the form of sodium selenite, selenocysteine or selenoyeast are the only active ingredients in the composition and/or wherein the selenium is present in an amount of between about 70 μg and about 120 μg, Applicants submit that the asserted combination does not provide a full consideration of all claim elements, i.e., patentable weight must be given to "selenium in the form of sodium selenite, selenocysteine or selenoyeast," "the only active agents in the composition," and "present in an amount between about 70 μg and about 120 μg," in claims 48, 58, 72-74 and 84 in judging the patentability of these claims over Kronnie, Cauwenbergh, Proctor and Nishida.

For at least these reasons, claims 48, 58, 72-74 and 84 are patentable over Kronnie in view of Cauwenbergh, Proctor and Nishida. The remaining claims, which depend, directly or indirectly, from independent claims 48, 58, 72-74 and 84, are also patentable over the above-asserted combination of references for at least the reasons that claims 48, 53, 62-64 and 74 are patentable thereover.

As a final matter, Applicants recognized that the Official Action of June 17 states that "no claims are allowed." However, upon review of the outstanding rejections, Applicants noted that no basis was provided for the rejection of claim 18. As new claims 70 and 71 correspond closely to canceled claim 18, Applicants respectfully request consideration of claims 70 and 71.

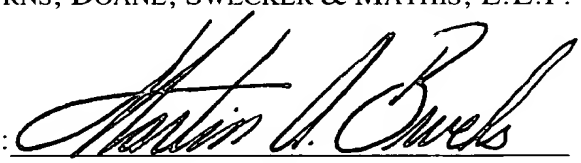
From the foregoing, Applicants earnestly solicit further and favorable action in the form of a Notice of Allowance.

If there are any questions concerning this paper or the application in general, Applicants invite the Examiner to telephone the undersigned at the Examiner's earliest convenience.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: December 15, 2003

By: 

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Attachments: Partial Unofficial Translation of DE 1975921
Pages 1546-1547 of Merck Index (13 th Edition, 2001)

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8735. Sodium Phosphate, Radioactive. [8027-28-9] Sodium phosphate—^{32}P; radioactive sodium phosphate; sodium radiophosphate (^{32}P); Phosphotope.

Aq soln of mixed radioactive phosphates with a pH range of 5.0-6.0. Contains radioactive monobasic sodium phosphate ($NaH_2^{32}PO_4$) and radioactive dibasic sodium phosphate ($Na_2H^{32}PO_4$). ^{32}P is a pure beta emitter with a half-life of 14.3 days.

THERAP CAT: Antineoplastic; antipolycythemic; diagnostic aid (neoplasm).

8736. Sodium Phosphate, Tribasic. [7601-54-9] Trisodium orthophosphate; trisodium phosphate; TSP; Oakite. Na_3O_4P; mol wt 163.94. Na 42.07%, O 39.04%, P 18.89%. Na_3PO_4. Crystallizes with 8 and 12 mols of H_2O.

Dodecahydrate. Colorless or white crystals. When rapidly heated melts at ~75°. Does not lose the last mol of water even on moderate ignition. d 1.6. Sol in 3.5 parts water, 1 part boiling water; insol in alcohol. The aq soln is strongly alkaline. pH of 0.1% soln: 11.5; of 0.5% soln: 11.7; of 1.0% soln: 11.9. Technical crystals are sometimes made with excess alkali to prevent caking and give more alkaline solutions. LD_{50} orally in rats: 7.40 g/kg, H. F. Smyth *et al., Am. Ind. Hyg. Assoc. J.* **30,** 470 (1969).

USE: In photographic developers; clarifying sugar; removing boiler scale, softening water; manuf paper; laundering; tanning leather; in detergent mixture.

8737. Sodium Phosphite. [13708-85-5] HNa_2O_3P; mol wt 125.96. H 0.80%, Na 36.50%, O 38.11%, P 24.59%. Na_2HPO_3.

Pentahydrate. White, hygroscopic cryst powder. Heat of formation (25°): −684.2 kcal/mole. Freely sol in water. *Keep well closed.*

8738. Sodium Phosphomolybdate. [1313-30-0] Sodium molybdophosphate. $Mo_{12}Na_3O_{40}P$; mol wt 1891.22. Mo 60.87%, Na 3.65%, O 33.84%, P 1.64%. $Na_3PO_4.12MoO_3$.

White crystals. Freely sol in water.

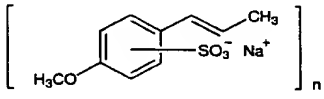
USE: As reagent in chemical analysis.

8739. Sodium Phosphotungstate. [51312-42-6] Sodium tungstophosphate. Approx $2Na_2O.P_2O_5.12WO_3.18H_2O$.

White, granular powder. Sol in water.

USE: As reagent for alkaloids, uric acid, potassium.

8740. Sodium Polyanetholesulfonate. [52993-95-0] Polyanetholesulfonic acid sodium salt; anetholesulfonic acid sodium salt polymer. A polymer of anetholesulfonic acid. Originally developed as an anticoagulant, it was soon found that it possesses anticomplement action and lowers the bactericidal action of blood. *Ref:* Demole, Reinert, *Arch. Exp. Pathol. Pharmakol.* **158,** 211 (1930); Friedmann, *Klin. Wochenschr.* **14,** 215 (1935); Stuart, *J. Clin. Path.* **1,** 311 (1948); Hoffmann-La Roche *Biochemicals Catalog.*



Light brown powder. Insol in alcohol. Swells in water and slowly goes in soln with neutral reaction. Aq solns are stable to heat, dil alkalies and dil acids.

USE: Under the trademark ***Liquoid*** to inhibit blood coagulation *in vitro,* and as diagnostic reagent to encourage the growth of pathogens in blood. Also to stabilize colloidal solns such as milk and gelatin. (Not to be confused with Liquoid, registered trademark of Johnson & Johnson for castor and olive oil emulsion.)

8741. Sodium Polymetaphosphate. [50813-16-6] Graham's salt; "sodium hexametaphosphate"; glassy sodium metaphosphate; Hy-Phos. $(NaPO_3)_x$. A mixture of polymeric metaphosphates; not a hexamer. Prepd by rapidly chilling molten sodium metaphosphate: Bell, *Inorg. Syn.* **3,** 103 (1950). *Reviews: see* Sodium Metaphosphate.

Clear, hygroscopic glass. mp 628°. Sol in water, b solves slowly. Depolymerizes in aqueous soln to form trimetaphosphate and sodium orthophosphates.

Sodium hexametaphosphate detergents. Calgon; Quadrafos; Hagan phosphate; Micromet. Mixtures con ham's salt as the principal agent. Supplied in the for powder, flakes, and as small, broken, glass-like particl in water (pH adjusted to 8-8.6). Insol in organic solvent sess dispersing and deflocculating properties, coagulat mins, and inhibit the crystn of slightly sol compds such cium carbonate and calcium sulfate.

USE: Water softeners and detergents. For leather t dyeing, laundry work, textile processing; for the "th treatment" of softening industrial water supplies.

8742. Sodium Polystyrene Sulfonate. [9003-59- sonium A; Kayexalate. A cation exchange resin charg sodium.

Marketed as a powder, insol in water; also as an e with methyl cellulose.

THERAP CAT: Ion-exchange resin (potassium).

8743. Sodium Propionate. [137-40-6] Propionic dium salt; Impedex. $C_3H_5NaO_2$; mol wt 96.06. C 37. 5.25%, Na 23.93%, O 33.31%. CH_3CH_2COONa.

Transparent crystals, granules. Deliquescent in mo Neutral or slightly alkaline reaction to litmus. One gr solves in ~1 ml water, in ~0.65 ml boiling water, in alcohol at 25°. Most active at acid pH: Wolford, An *Food Ind.* **17,** 622 (1945); Olsen, Macy, *J. Dairy Sci.* (1946).

USE: Fungicide, mold preventative.

THERAP CAT: Antifungal (topical).

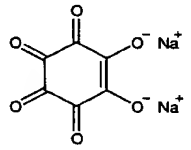
THERAP CAT (VET): In ketoses of ruminants (glucose sor). Antifungal agent. Has been used in dermatoses, infections, conjunctivitis.

8744. Sodium Pyroantimonate. [10049-22-6] antimonate. Approx $Na_2H_2Sb_2O_7$.

Monohydrate. White, granular powder. Slightly water.

USE: Manuf opaque glass and opaque glazes.

8745. Sodium Rhodizonate. [523-21-7] 5,6-Dihy 5-cyclohexene-1,2,3,4-tetrone disodium salt; [(3,4,5,6-te 1-cyclohexen-1,2-ylene)dioxy]disodium. $C_6Na_2O_6$; n 214.04. C 33.67%, Na 21.48%, O 44.85%.



Violet crystals. Sol in water with an orange-yellow slightly sol in soda soln; insol in alc. Solns are unstab in the refrigerator, and must be prepd fresh every other

USE: As a reagent for barium and strontium.

8746. Sodium Selenate. [13410-01-0] Na_2O_4Se; 188.94. Na 24.34%, O 33.87%, Se 41.79%. Na_2SeO_4. toxicity study: C. Nofre *et al., C. R. Acad. Sci.* **257,** 791 Review: *NTP Technical Report on Toxicity Studies of Selenate and Sodium Selenite* (NIH 94-3387, 1994) 121

Decahydrate. [10102-23-5] White crystals; very so ter. LD_{50} i.p. in mice: 18.45 mg/kg (Nofre).

USE: Insecticide in some horticultural applications.

THERAP CAT (VET): Dietary growth promoter for pou livestock.

8747. Sodium Selenide. [1313-85-5] Na_2Se; 124.94. Na 36.80%, Se 63.20%. Prepd by adding sele a soln of sodium in liquid ammonia: Hugot, *Compt. Re* 299 (1899); *Ann. Chim. Phys.* [7] **21,** 34 (1900); Feher i

628°. Sol in water, but dis- aqueous soln to form sodium ophosphates.

detergents. Calgon; Gilter; cromet. Mixtures contg Gra- . Supplied in the form of a ken, glass-like particles. Sol isol in organic solvents. Pos- g properties, coagulate albu- htly sol compds such as cal- e.

rgents. For leather tanning, ocessing; for the "threshold water supplies.

sulfonate. [9003-59-2] Re- exchange resin charged with

water; also as an emulsion

a (potassium).

[37-40-6] Propionic acid so- ol wt 96.06. C 37.51%, H H_3CH_2COONa. Deliquescent in moist air. n to litmus. One gram dis- al boiling water, in ~24 ml d pH: Wolford, Andersen, Macy, *J. Dairy Sci.* **29,** 173

ve.
).

ruminants (glucose precur- used in dermatoses, wound

te. [10049-22-6] Sodium

ır powder. Slightly sol in

aque glazes.

523-21-7] 5,6-Dihydroxy- ium salt; [(3,4,5,6-tetraoxo- ium. $C_6Na_2O_6$; mol wt 4.85%.

Na^+

Na^+

an orange-yellow color. . Solns are unstable even fresh every other day. strontium.

0-01-0] Na_2O_4Se; mol wt 41.79%. Na_2SeO_4. Acute *Acad. Sci.* **257,** 791 (1963); *Toxicity Studies of Sodium* 4-3387, 1994) 121 pp. te crystals; very sol in wa- Nofre).

ural applications. promoter for poultry and

3-85-5] Na_2Se; mol wt pd by adding selenium to Hugot, *Compt. Rend.* **129,** 34 (1900); Feher in *Hand-*

book of Preparative Inorganic Chemistry **vol. 1,** G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) p 421.

Amorphous crystals. d^{10} 2.625. mp >875°. Turns red on exposure to air and deliquesces. Dec in water. Insol in ammonia.

Hemienneahydrate. Fine needles. Turns red on exposure to air and deliquesces.

Decahydrate. Needles. Turns red and then brown on exposure to air.

Hexadecahydrate. Prisms. mp 40°. Dec in air to sodium carbonate, selenium and a small amount of sodium selenide.

8748. Sodium Selenite. [10102-18-8] Selenious acid disodium salt. Na_2O_3Se; mol wt 172.94. Na 26.59%, O 27.76%, Se 45.66%. Na_2SeO_3. Prepd by evaporating an aqueous solution of sodium hydroxide and selenious acid between 60° and 100°: Krak, *J. Am. Ceram. Soc.* **12,** 530 (1929); by heating a mixture of sodium chloride and selenium oxide: Cameron, Macallan, *Proc. Roy. Soc.* **46,** 13 (1890). Metabolism: M. Sandholm, *Acta Pharmacol. Toxicol.* **33,** 6 (1973); H. W. Symonds *et al., Brit. J. Nutr.* **45,** 117 (1981). Mutagenicity study: M. Nodo *et al., Mutat. Res.* **66,** 175 (1979). Toxicity study: Cummins, Kimura, *Toxicol. Appl. Pharmacol.* **20,** 89 (1971).

Tetragonal prisms. Stable in air. Freely sol in water. Insol in alcohol. LD_{50} orally in rats: 7 mg/kg (Cummins, Kimura).

Pentahydrate. Acicular crystals. Loses water of crystn in dry air.

USE: Removing green color from glass during its manuf; alkaloidal reagent.

8749. Sodium Sesquicarbonate. [533-96-0] Urao; trona. $C_2HNa_3O_6$; mol wt 190.00. C 12.64%, H 0.53%, Na 36.30%, O 50.52%. $Na_2CO_3.NaHCO_3$. Found in nature as the dihydrate, e.g., Owens Lake, Searles Lake (U.S.A.); Lake Magadi (Kenya). Produced on a large scale from sodium carbonate and a slight excess of sodium bicarbonate: Schenk in *Winnacker-Weingaertner, Chemische Technologie* **vol. I** (München, 1950) p 427.

Dihydrate. Monoclinic needles, d 2.112. Crystals are stable in air. Soly in water (g/100 ml) at 0°: 13; at 100°: 42. Aq solns are mildly alkaline. pH of 0.1*M* soln = 10.1.

Caution: Irritating to skin, mucous membranes.

USE: Chiefly in laundering in conjunction with soap.

8750. Sodium Silicate. [1344-09-8] Water glass; soluble glass. Manuf: *Faith, Keyes & Clark's Industrial Chemicals,* F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 755-761.

The compositions of the commonly available sodium silicates in dry form are: Na_2SiO_3, $Na_6Si_2O_7$, and $Na_2Si_3O_7$, with variable amounts of water, the first-named containing approx $5H_2O$. They are in the form of colorless to white or grayish-white, crystal-like pieces or lumps. These silicates are very slightly sol or almost insol in cold water. They are best brought into soln by heating with water under pressure. They are less readily sol in large amounts of water than in small amounts of water, and the anhydr dissolve with more difficulty than the hydrated silicates; also, the silicates containing more sodium dissolve more readily. The aq solns are strongly alkaline. The dry sodium silicates are used relatively little. *See also* Sodium Metasilicate.

Caution: Irritating and caustic to skin, mucous membranes. If swallowed causes vomiting and diarrhea.

USE: Lining Bessemer converters, acid concentrators. Manuf grindstones, abrasive wheels (as binder only).

8751. Sodium Silicate Solution. [1344-09-8] Sodium silicate solns of varying composition with respect to the ratio between sodium and silica, as well as of various densities, are available. One of the most commonly used sodium silicate solns, also known as "egg preserver", contains ~40% $Na_2Si_3O_7$. Solns of sodium silicate are strongly alkaline and are readily dec by acids with separation of silicic acid. The greater the ratio of Na_2O to SiO_2 (the greater the alkalinity) the more tacky is the soln.

USE: For preserving eggs; fireproofing fabrics; as a detergent in soaps; as adhesive; waterproofing walls; in cements; in cold-water paints; manuf of abrasive wheels; weighting silk, etc.

8752. Sodium Stannate(IV). [12058-66-1] Sodium tin oxide. Na_2O_3Sn; mol wt 212.69. Na 21.62%, O 22.57%, Sn 55.81%. Na_2SnO_3.

Trihydrate. White or colorless crystals; gradually dec in the air; dec by weak acids. Sol in ~1.7 parts water; insol in alcohol. The aq soln is alkaline. *Keep well closed.*

USE: As mordant in dyeing and printing calico; for fireproofing of curtains, etc.

8753. Sodium Stearate. [822-16-2] Stearic acid sodium salt. Approx $C_{18}H_{35}NaO_2$. Usually contains sodium palmitate.

White powder; soapy feel; slight, tallow-like odor. Slowly soluble in cold water or cold alcohol; freely sol in the hot solvents. The aq soln is strongly alkaline, due to hydrolysis; the alcohol soln is practically neutral.

USE: Pharmaceutic aid (emulsifying and stiffening agent). In glycerol suppositories; also in toothpaste; as waterproofing agent.

8754. Sodium Succinate. [150-90-3] Succinic acid sodium salt; disodium succinate; Soduxin. $C_4H_4Na_2O_4$; mol wt 162.05. C 29.65%, H 2.49%, Na 28.37%, O 39.49%. Acute toxicity and clinical experience: M. Zuckerbrod, I. Graef, *Ann. Int. Med.* **32,** 905 (1950).

LD_{50} i.v. in mice: 4.5 g/kg (Zuckerbrod, Graef).

Hexahydrate. Granules or crystalline powder; stable in air. Loses all its water at 120°. Sol in ~5 parts water. Insol in alcohol. The aq soln is neutral or slightly alkaline.

THERAP CAT: Respiratory stimulant, analeptic; urinary alkalizer, diuretic; cathartic.

8755. Sodium Sulfate. [7757-82-6] Na_2O_4S; mol wt 142.04. Na 32.37%, O 45.05%, S 22.57%. Na_2SO_4. Occurs in nature as the minerals ***mirabilite***, ***thenardite***. Industrial production: *Faith, Keyes & Clark's Industrial Chemicals,* F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) p 762-768.

Anhydrous form, ***salt cake*** (technical grade). Powder or orthorhombic bipyramidal crystals, mp ~ 800°. d 2.7. Sol in ~3.6 parts water. Max soly at 33°: 1 in 2. Above this temp the soly gradually decreases and at 100° requires 2.4 parts water. Insol in alcohol.

Decahydrate. Glauber's salt. $Na_2O_4S.10H_2O$. Odorless, efflorescent crystals or granules, mp 32.4°. d 1.46. Loses all its water at 100°. Sol in 1.5 parts water at 25°, in 3.3 parts water at 15°. Soly in water decreased by NaCl. Sol in glycerol; insol in alcohol. The aq soln is neutral. pH 6-7.5. *Keep well closed in a cool place.*

USE: For standardizing dyes; in freezing mixtures; in dyeing and printing textiles. The *anhydrous* form for drying organic liquids; in Kjeldahl nitrogen determination; in manuf of glass, ultramarine, paper pulp.

THERAP CAT: Cathartic.

THERAP CAT (VET): Purgative.

8756. Sodium Sulfide. [1313-82-2] Sodium monosulfide; sodium sulfuret. Na_2S; mol wt 78.05. Na 58.91%, S 41.08%. Best prepd from the elements in liq ammonia, also obtained by dehydration of the nonahydrate: Courtois, *Compt. Rend.* **207,** 1220 (1938); Klemm *et al., Z. Anorg. Allgem. Chem.* **241,** 281 (1939); Feher in *Handbook of Preparative Inorganic Chemistry,* **vol 1,** G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) pp 358-360. *Review:* C. Drum in *Kirk-Othmer Encyclopedia of Chemical Technology* **vol. 21** (Wiley-Interscience, New York, 3rd ed., 1983) pp 256-262.

Cubic crystals or granules. Extremely hygroscopic. Discolors upon exposure to air. d_4^{14} 1.856. mp 1180° *(in vacuo)*; also reported as mp 920°. Soly in water (g/100 g H_2O): 8.1 (−9.0°); 12.4 (0°); 18.6 (20°); 29.0 (40°); 35.7 (48°); 39.0 (50°). Slightly sol in alcohol. Insol in ether. Aq solns are strongly alkaline.

Pentahydrate. Flat, shiny, four-sided, prismatic crystals. Loses 3 mols water at 100°. mp 120° (with loss of all water of crystn). Freely sol in water. Also sol in alcohol. Aq solns are strongly alkaline. Insol in ether. Dec by acids with evolution of H_2S.

Nonahydrate. Tetragonal, deliquescent crystals. Odor of hydrogen sulfide. Discolors upon exposure to light and air (first